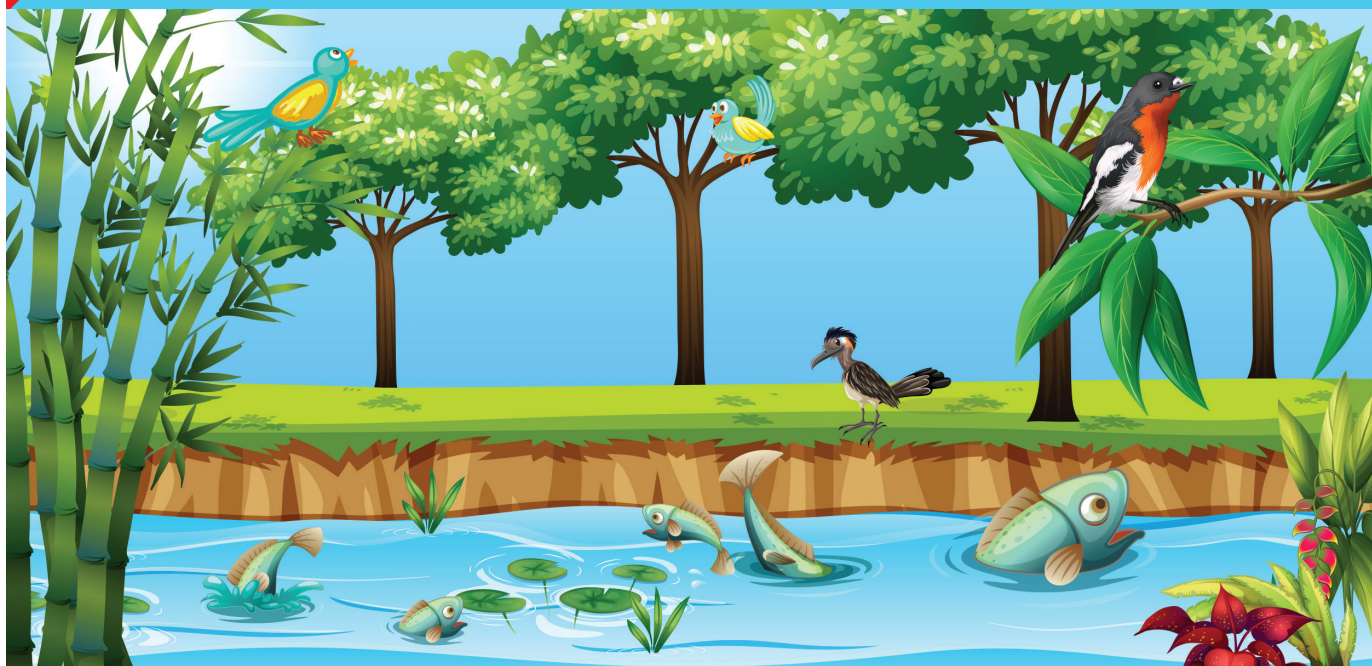


PROTOTYPE



NCDC

NATIONAL CURRICULUM
DEVELOPMENT CENTRE



MATHEMATICS

TEACHER'S GUIDE

SENIOR ONE



LOWER SECONDARY
CURRICULUM

PROTOTYPE



NCDC
NATIONAL CURRICULUM
DEVELOPMENT CENTRE

MATHEMATICS

TEACHER'S GUIDE

SENIOR ONE



**LOWER SECONDARY
CURRICULUM**



DISCLAIMER!!

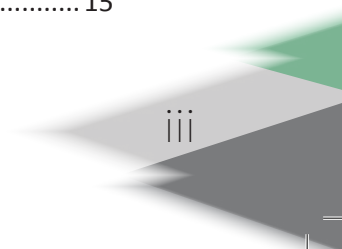
This material has been developed strictly for training purposes. Content and images have been adapted from several sources which we might not fully acknowledge. This document is therefore restricted from being reproduced for any commercial purposes

National Curriculum Development Centre
P.O. Box 7002,
Kampala- Uganda
www.ncdc.co.ug



Contents

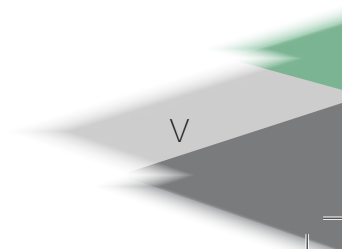
Preface	vi
Acknowledgements.....	vii
Topic 1.....	1
NUMBER BASES.....	1
Sub-topic 1: Representing Numbers in Different Bases on the Abacus.....	1
Sub-topic 1.2: Identifying Place Values Using the Abaci.....	3
Sub-topic 1.3: Converting Numbers from base ten to any other base.....	4
Sub-topic 1.4: Operation on Numbers in Various Bases.....	5
Topic 2:.....	9
WORKING WITH INTEGERS	9
Sub-topic 2.1: Natural Numbers	9
Sub-topic 2.2: Differentiate between Natural Numbers and Whole Numbers/Integers.....	10
Sub-topic 2.3: Use Directed Numbers (limited to integers) in Real-life Situations	11
Sub-topic 2.4: Use the Hierarchy of Operations to Carry Out the Four Mathematical Operations on Integers.....	12
Sub-topic 2.5: Identify Even, Odd, Prime and Composite Numbers.....	12
Sub-topic 2.6: Finding the Prime Factors of any Number.....	12
Sub-topic 2.7: Relate Common Factors with HCF and Multiples with LCM...	13
Sub-topic 2.8: Work out and Use Divisibility Tests of some Numbers	13
Sub-topic 2.9: Least Common Multiple (LCM).....	13
Topic 3:.....	14
FRACTIONS, PERCENTAGES AND DECIMALS.....	14
Sub-topic 3.1: Describe Different Types of Fractions	15
Sub-topic 3.2: Convert Improper Fractions to Mixed Numbers and Vice Versa	15



Sub-topic 3.3: Operations on Fractions and Decimals.....	16
Sub-topic 3.5: Convert Fractions to Decimals and Vice Versa	17
Sub-topic 3.6: Non-terminating and Recurring Decimals	17
Sub-topic 3.7: Converts Recurring Decimals into Fractions.....	17
Sub-topic 3.8: Convert Fractions and Decimals into Percentages and Vice Versa	17
Sub-topic 3.9: Calculates a Percentage of a Given Quantity	18
Sub-topic 3.10: Works out Real-life Problems Involving Percentages.....	18
Sub-topic 3.11: Identifying and Classifying Decimals as Terminating, Non- terminating and Recurring Decimals	19
Topic 4:.....	21
RECTANGULAR CARTESIAN COORDINATES IN 2 DIMENSIONS	21
Sub-topic 4.1: Plotting Polygons (shapes).....	22
Topic 5:.....	26
GEOMETRIC CONSTRUCTION SKILLS.....	26
Sub-topic 5.1: Draw perpendicular and parallel lines.....	26
Sub-topic 5.2: Construction of Perpendicular lines	27
Sub –topic 5.2: Using a Ruler, Pencil and Pair of Compasses, Construct Special Angles	27
Sub-topic 5.3: Describing Locus Question.....	28
Sub-topic 5.4: Construction of Geometric Figure	28
Topic 6:.....	32
SEQUENCE AND PATTERNS.....	32
Sub-topic 6.1: Draw and identify the patterns	32
Sub-topic 6.2: Describing the general rule.....	33
Sub-topic 6.2: Generating Number Sequence	34
Sub-topic 6.3: Formulae for General Terms	34
Topic 7:.....	39



BEARINGS.....	39
Sub-topic 7.2: Bearings	41
Topic 8:.....	45
GENERAL AND ANGLE PROPERTIES OF GEOMETRIC FIGURES.....	45
8.1: Identify Different Angles	45
Sub- topic 8.2: Angles on a Line and Angles at a Point	45
Topic 9:.....	46
DATA COLLECTION AND PRESENTATION	46
Sub-topic 9.1: Types of Data	46
Sub-topic 9.2: Collecting Data.....	47
Topic 10:.....	51
REFLECTION.....	51
Sub-topic 10.1: Identify Lines of Symmetry for Different Figures	51
Sub-topic 10.2: Reflection in the Cartesian Plane.....	52
Topic 11:.....	53
EQUATION OF LINES AND CURVES	53
Sub-topic 11.1 Function Machines	55
Sub-topic 11.2: Linear Equations	56
Topic 12:.....	59
TIME AND TIME TABLES.....	59
Subtopic 12.1: Telling the Time	59
Sub-topic 12.2: 12-hour and 24-hour Clocks	61
Sub-topic 12.3: Units of time	62
Sub-topic 12.4: Timetables	63



Preface

This Teacher's Guide has been designed to enable the teacher to interpret the revised curriculum and use the accompanying learner textbook effectively. The Teacher's Guide provides guidance on what is required before, during and after the teaching and learning experiences.

To ease the work of the teacher, all the activities and instructions in the Learner's Book have been incorporated in this Guide but with additional information and possible responses to the activities. The guide has been designed bearing in mind the major aim of the revised curriculum which is to build in the learners the key competences that are required in the 21st century while promoting values and attitudes and effective learning and acquisition of skills, to prepare the learner for higher education and eventually the world of work.

This book has been written in line with the Revised Lower Secondary School Curriculum. The book has incorporated knowledge, skills partly required to produce a learner who has the competences that are required in the 21st century; promoting values and attitudes; effective learning and acquisition of skills in order to reduce unemployment among school graduates.



Associate Professor Betty Ezati

Chairperson, NCDC Governing Council

Acknowledgements

National Curriculum Development Centre (NCDC) would like to express its appreciation to all those who worked tirelessly towards the production of the Teacher's Guide.

Our gratitude goes to the various institutions which provided staff who worked as a panel, the Subject Specialist who initiated the work and the Production Unit at NCDC which ensured that the work produced meets the required standards. Our thanks go to **Enabel** which provided technical support in textbook development.

The Centre is indebted to the learners and teachers who worked with the NCDC Specialist and consultants from Cambridge Education and Curriculum Foundation.

Last but not least, NCDC would like to acknowledge all those behind the scenes who formed part of the team that worked hard to finalise the work on this Learner's Book.

NCDC is committed to uphold the ethics and values of publishing. In developing this material, several sources have been referred to which we might not fully acknowledge.

We welcome any suggestions for improvement to continue making our service delivery better. Please get to us through P. O. Box 7002 Kampala or email us through admin@ncdc.go.ug.



Grace K. Baguma

Director, National Curriculum Development Centre



Topic 1

NUMBER BASES

By the end of this topic, the learner should be able to:

- i) use his/her knowledge of decimal place value to develop their understanding of numbers written in other bases.
- ii) identify numerals in any base up to base 16 using abacus (k).
- iii) identify place values of different bases (u).
- iv) convert numbers from one base to another (u).
- v) manipulate numbers in different bases with respect to all four operations (u, s).

Sub-topic 1: Representing Numbers in Different Bases on the Abacus

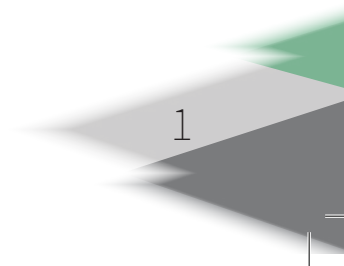
Let the individual learner tell you what he/she knows about the number bases.

Activity 1.1: In your groups, identify situations in which you have ever used number bases in your life.

Real-life situation	Base	Reason for the base chosen
Days of the week	Base Seven	Seven days in a week

Let the learners do this activity in groups.

Observe the learners as they do the activity. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group.

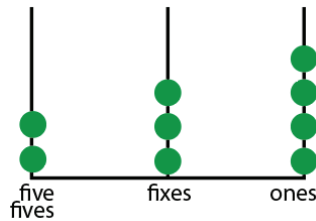


Note down what you have observed and assist the learner where necessary.

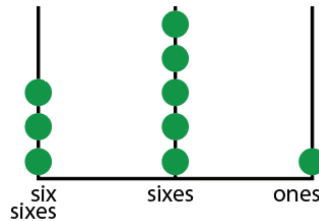
Groups present to the whole class and members suggest improvement to each presentation.

Guide the learners in the discussion of the presentations to harmonise or sort out the real-life situations, corresponding bases and the reasons for their choices of bases.

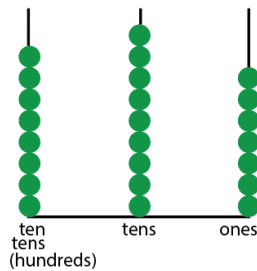
a) 234_{five}



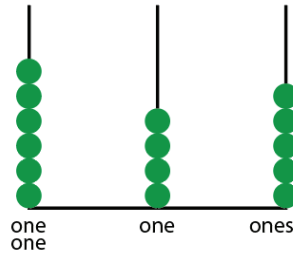
b) 351_{six}



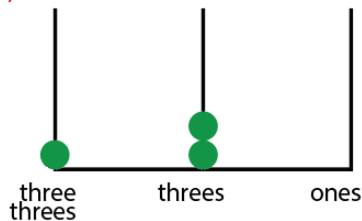
c) 897_{ten}



d) 645_{nine}



e) 120_{three}



Activity 1.2: List the numerals for the following bases.

This activity should be done while the learners are in groups.

Let the learners write the responses in their exercise books.



Observe the learners as they do the activity. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group.

Note down what you have observed and assist the learner accordingly.

Groups present their responses to the class by explaining which symbols (numeral) they used after numeral nine.

Note: In (ix) there are spaces after numeral e, because each individual learner can use different symbols to represent different numerals in base sixteen after numeral e.

Sub-topic 1.2: Identifying Place Values Using the Abaci

Activity 1.3: Making abaci

Help the learners make different abaci in their groups .

Let the individual learner tell you what he/she knows about the place values in various number bases.

Prepare the materials to be used in making the abaci by the learners prior to the beginning of the Mathematics lesson in which the learners will make the Abaci.

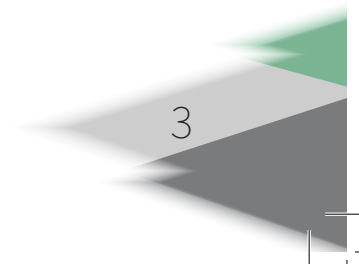
The learners can make their own abaci if the School does not have enough abaci.

Activity 1.4: Reading and stating the value of digits in bases

Let the learners do this activity in groups.

Observe the learners as they do the activity. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Guide the groups if necessary.

Groups should present their work to the class.



Guide the learners to correctly read and state what each digit in the numbers represents.

Let the learners write the responses in their exercise books.

Write down what you have observed in your Record Book.

For the exercises help the learners with collect answers.

Sub-topic 1.3: Converting Numbers from base ten to any other base

Activity 1.5: Converting numbers from base ten to any other base

Observe the learners as they convert the numbers in their groups.

Demonstrate to learners how conversion is done by using an example.

Example: Convert 244_{five} to base ten

Solution: $244_{\text{five}} = (2 \times 5^2) + (4 \times 5^1) + (4 \times 5^0)$

$$= 2 \times 25 + 4 \times 5 + 4 \times 1$$

$$= 50 + 20 + 4 = 74$$

Or $244_{\text{five}} = 2 \times 5 = 10$, $10+4 = 14$, now $14 \times 5 = 70$ then add on 4 which gives 74 base ten

(You should teach the learners the second approach of converting numbers to base ten. **(This is the repeated multiplication)**)

Activity 1.6: Converting numbers in a given base to another base

Let the learners do this activity individually.

Observe the learners as they do the activity. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.



Let the learners write the responses in their exercise books. They can also explain how they have worked out the answers. The explanation can be done to you or the class.

Record each learner's achievement.

Mark the learner's work and make corrections.

The arrangement of the responses is that they start from the first box on the right hand side then write the responses towards the left side. So, the arrangement is 1110. We are using only two numerals which is the binary system.

The next step is to convert the responses to base ten.

Therefore, $1110_{\text{two}} = 1x2^3 + 1x2^2 + 1x2^1 + 0x2^0 = 8+4+2+0 = 14$. Hence, the number the learners selected is 14.

Inform the learners that number bases can be used in coding, storage of secret information, communication etc.

Guide the learners to generate answers for the practice.

Sub-topic 1.4: Operation on Numbers in Various Bases

Observe the learners as they are taken through this sub-topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

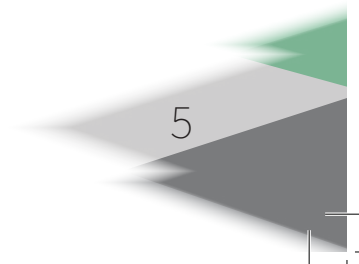
Activity 1.6: Operations on numbers with mixed bases

In their groups guide the learners work out the operations

Number Game:

Presentation of responses

"Yes" is represented by 1 and "No" is by 0



Example: If the responses are that the number is not in box 1 (this is represented by 0), then the number is in box 2; it is represented by 1. The number is in box 3, the response is 1 and the response is that number is in box 4, this is represented by 1.

Guide the learners where necessary and record their achievements.

Let the learners do the exercise in this sub-topic in their exercise books.

Situation of Integration

A community is hit by famine and the government decides to give each member in the household a potato to solve their problem of hunger.

Support: Each package contains an equal number of potatoes of five.

There are 10 households in the community with 3, 5, 7, 4, 6, 5, 8, 12, 13 members respectively.

Resources: Knowledge of bases, knowledge of mathematical operations

Task: Determine the number of packages of potatoes the government will take to that community. In case there are remaining potatoes, discuss what the government should do with them.

This should be done through group discussions. You should guide the learners' discussions.

You can give another scenario apart from that one in the Learner's Textbook.

Evaluation Criteria for the Task in Learner's Textbook on Page 9

Output 1: Food (potato) distribution plan

C1 = correct Interpretation of the problem

C2 = correct use of subject matter resources

C3 = coherent flow of ideas

	C1	C2	C3	C4 (Excellent)
Output (planning)	/3	/3	/3	/1



C1 -Correct Interpretation of the Problem	C2-Correct Use of Subject Matter Resources	C3- Coherent Flow Ideas	C4 - Excellence
<p>Indicators</p> <ul style="list-style-type: none"> • The situation is arousing the use of knowledge from other situations and clearly defined. • Collects correct information about the community. 	<p>Indicators</p> <ul style="list-style-type: none"> • Reflects on knowledge about Bases, Mathematical operations, Counting/grouping. • Identifies the correct Mathematical operations for the task. • Selects the right materials for the task. 	<p>Indicators</p> <ul style="list-style-type: none"> • Formulation of ideas leading to the development of the procedure • Drawing a distribution plan • Finished acceptable distribution plan 	<p>Indicators</p> <ul style="list-style-type: none"> • Neatness • organized

Total Mark = 10

Output 2: Number of households and number of members of each of the households

C1 = correct Information collected

C2 = Correct presentation of Data

C3 = coherent flow of ideas

C4 = Good communication skills

	C1	C2	C3	C4 (Excellent)
Output (planning)	/3	/3	/3	/1

C1 - Correct Interpretation of the Problem	C2-Correct use of Subject Matter Resources	C3 – Coherent Flow Ideas	C4 - Excellence
Indicators <ul style="list-style-type: none"> The situation is arousing the use of knowledge from other situations and clearly defined Collects correct information about the number of households and members of each household 	Indicators <ul style="list-style-type: none"> Reflects on knowledge about Bases, Mathematical operations, Counting/grouping Identifies the correct Mathematical operations for the task Selects the right materials for the task 	Indicators <ul style="list-style-type: none"> Formulation of ideas leading to the development of the procedure Drawing a distribution plan Finished acceptable distribution plan 	Indicators <ul style="list-style-type: none"> Logical reasons for the answer Recording Members of the household by sex

Total Mark = 10



Topic 2:

WORKING WITH INTEGERS

By the end of this topic, the learner should be able to carry out calculations with positive and negative integers by:

- i) identifying reading and writing natural numbers as numerals and words in million, billion and trillion (u, s).
- ii) differentiating between natural numbers and whole numbers/integers (u).
- iii) identifying directed numbers (k).
- iv) using directed numbers (limited to integers) in real-life situations (u, s).
- v) using the hierarchy of operations to carry out the four mathematical operations on integers (u).
- vi) identifying even, odd, prime and composite numbers (k, u).
- vii) finding the prime factorisation of any number (k, u, s).
- viii) relating common factors with HCF and multiples with LCM (k, u, s, v).
- ix) working out and use divisibility tests of some numbers. (k, u, s, v/a).

Sub-topic 2.1: Natural Numbers

Observe the learners as they go through this sub-topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In groups, let the learners discuss what the natural numbers are. Record individual learner's and groups' achievements

Let the learners do the exercise in this sub-topic in their exercise books.

Activity 2.1: Natural Numbers

Prepare the numbers, the board and the box prior to this activity. You may use the learners to make the cards and write the numbers both in words and in figure on the cards.

This activity should be done in groups.

Observe the learners as they go through this sub-topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Activity 2.2: Writing and reading numbers

Provide two sets of cards: one set has cards with numbers in figures another set has numbers in words. Observe the learners as they go through this sub-topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Supervise the learners as they work out the exercise in pairs.

Answers to some numbers for the exercise

1. Three thousand eight hundred
2. Eight million, eight thousand eight
3. Six hundred six million, five hundred twenty thousand, sixty
4. Nine billion, nine hundred nine thousand, eight hundred
5. One trillion, six hundred twenty-nine billion, two hundred eighty-four million, seven hundred twenty-nine thousand

Sub-topic 2.2: Differentiate between Natural Numbers and Whole Numbers/Integers**Activity 2.3: Relating natural numbers and integers**

Observe the learners as they go through this activity. Look out for the individual learner's active participation, cooperation with members, and how



he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Sub-topic 2.3: Use Directed Numbers (limited to integers) in Real-life Situations

Let the learners identify real-life situations where these directed numbers can be used.

Guide them in describing the directed numbers.

Activity 2.4: Integers in real-life situations

Observe the learners as they go through this activity in groups or pairs. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Discuss the use of integers in real life situations with Individual learners.

In groups, the learners present their answers to questions 1 to 4 to the whole class.

You should wrap up/harmonise their answers.

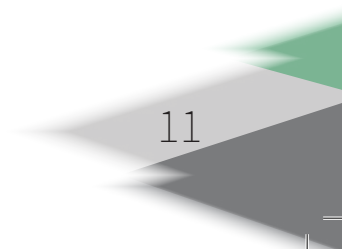
Activity: 2.5 Real-life situations

Provide the learners with hot water and a thermometer.

Observe the learners as they go through this activity. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In groups, the learners present their answers to questions 1 and 2 to the whole class.

You should wrap up/harmonise their answers.



Sub-topic 2.4: Use the Hierarchy of Operations to Carry Out the Four Mathematical Operations on Integers

Activity 2.6: Operations on integers

Observe the learners as they work out the activity in pairs and guide them with the exercise.

Let the learners be in groups and they work out the answers to the exercise. Harmonize their answers. Let them exchange their books and mark each other's work.

Sub-topic 2.5: Identify Even, Odd, Prime and Composite Numbers

Activity 2.6. Identify even, odd, prime and composite numbers

Use the learners to make the number cards and let them write the numbers on the cards. The numbers written are natural numbers.

Observe the learners as they go through this activity. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In groups, the learners fill in the table provided in Learner's Textbook.

Guide them in answering questions 1 and 2 in Learner's Textbook

Sub-topic 2.6: Finding the Prime Factors of any Number

Let the learners be in groups as they work out the answers to the exercises. Harmonize their answers. Let them exchange their books and mark each other's work.



Sub-topic 2.7: Relate Common Factors with HCF and Multiples with LCM

Activity 2.7: Highest common factor

Let the learners be in groups as work out the answers Harmonize their answers. Let them exchange their books and mark each other's work.

Sub-topic 2.8: Work out and Use Divisibility Tests of some Numbers

Activity 2.8: Identifying divisibility tests for some numbers

In groups, let the learners work out the answers to the **activity** .Harmonize their answers. Let them discuss their findings.

In groups, let the learners work out the answers to the exercise. Harmonize their answers. Let them exchange their books and mark each other's work.

Sub-topic 2.9: Least Common Multiple (LCM)

Observe the learners as they go through this sub-topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Guide the learners in carrying out the activities and answering questions in Learner's Book (p. 34).

Topic 3:

FRACTIONS, PERCENTAGES AND DECIMALS

By the end of this topic, the learner should be able to understand and use fractions, decimals and percentages by: describing different types of fractions (k).

- i) converting improper fractions to mixed numbers and vice versa (k, s).
- ii) working out problems from real-life situations (u, s).
- iii) adding, subtracting, dividing and multiplying decimals (u, s).
- iv) converting fractions to decimals and vice versa (u, s).
- v) identifying and classifying decimals as terminating, non-terminating and recurring decimals (u).
- vi) converting recurring decimals into fractions (u, s).
- vii) converting fractions and decimals into percentages and vice versa (u, s).
- viii) calculating a percentage of a given quantity (s).
- ix) working out real-life problems involving percentages (u, s, v/a).

Observe the learners as they go through this topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In groups, let the learners discuss what the natural numbers are.

Let the learners do the exercise in this sub-topic in their exercise books.



Sub-topic 3.1: Describe Different Types of Fractions

Activity 3.1

Let the learners create a park of different cards and label them with different types of fractions, decimals and percentages.

Create different study play areas in class based on the numbers put on the cards.

From the park of the cards, let the learners pick a card and place it in the most appropriate play area.

Observe the learners as they go through this sub-topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In groups, let the learners work out the answers to the exercise. Harmonize their answers. Let them exchange their books and mark each other's work.

Sub-topic 3.2: Convert Improper Fractions to Mixed Numbers and Vice Versa

Mixed Numbers and improper Fractions

Observe the learners as they go through this sub-topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In groups, let the learners work out the answers to the exercise. Harmonize their answers. Let them exchange their books and mark each other's work.

Sub-topic 3.3: Operations on Fractions and Decimals

Observe the learners as they go through this sub-topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

3.4: Work out problems from real-life situations

Use fractions in a practical way. Observe the learners as they go through this sub-topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In groups, let the learners work out the answers to the exercise. Harmonize their answers. Let them exchange their books and mark each other's work.

Activity 3.3: Addition of fractions

In their groups, let the learners use a sheet of paper to work out $\frac{1}{5} + \frac{3}{5}$. Let them fold the paper into five equal parts. Let them shade off one part of the five equal parts.

They should shade the three parts of the five equal parts.

How many parts have been shaded?

Activity 3.4: Addition of fraction with the same denominators

Observe the learners as they go through the operations. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Sub-topic 3.5: Convert Fractions to Decimals and Vice Versa

Activity 3.5: Fractions and decimals

In groups, let the learners copy and complete the table. Let them discuss how they have obtained the answers. They should simplify the fractions if they can.

Observe the learners as they carry out the activity. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Activity 3.6: In pairs, convert the following fractions into decimals

Observe the learners as they work out. Guide them through the answers.

Sub-topic 3.6: Non-terminating and Recurring Decimals

Activity 3.7: Fraction percentage game

In groups, let the learners work out the answers to the exercise. Harmonize their answers. Let them exchange their books and mark each other's work.

Sub-topic 3.7: Converts Recurring Decimals into Fractions

Observe the learners as they carry out the activity. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Sub-topic 3.8: Convert Fractions and Decimals into Percentages and Vice Versa

Activity 3.7: Fraction percentage game

Observe the learners as they play the game. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Sub-topic 3.9: Calculates a Percentage of a Given Quantity

Activity 3.5

The table below shows students' marks in two math tests. For each one, calculate the percentage difference. Say if it is an increase or a decrease.

	Student	First test	Second test
(a)	Marion	50	45
(b)	James	40	52
(c)	Christina	20	35
(d)	Sarah	60	50

Observe the learners as they carry out the above activity. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using. Let the learners discuss their answers.

Sub-topic 3.10: Works out Real-life Problems Involving Percentages

In groups, let the learners work out the answers to the exercise. Harmonize their answers. Let them exchange their books and mark each other's work.

Sub-topic 3.11: Identifying and Classifying Decimals as Terminating, Non-terminating and Recurring Decimals

3.11.1: Converting fractions and decimals into percentages and vice versa

Activity 3.6: Converting decimals as terminating, non-terminating and recurring decimals

Guide the learners to work on their activities.

Situation of Integration

A primary school has two sections, that is, lower primary (P1-P4) and upper primary (P5-P7). The head teacher needs to draw a timetable for both sections. The two sections should start and end their morning lessons at the same time before break, start and end their break time at the same time. Then after break, lessons start at the same time. The lunch break for both sections starts at the same time.

Support: The time for the two sections to start is 8.00am. The duration of the lesson for the lower section is 30 minutes and that of the upper section is 40 minutes.

Resources: Knowledge of natural numbers, factors, multiples, lowest common multiples and of time.

Task: Help the Head teacher by drawing the timetable up to lunch break for the two sections. How many lessons does each section have up to lunch break?

Express the total number of lessons for the lower primary as a fraction of the total number of lessons for the whole School. (Consider lessons up to lunch break.)

This should be done in group discussions. You should guide the learners during the discussions.

You can give a scenario apart from that one in the Learner's Textbook.

Evaluation Criteria for the Task in learners' Textbook on Page 57

Output 1: Time Table

C1 = correct Interpretation of the problem

C2 = correct use of subject matter resources

C3 = coherent flow of ideas

	C1	C2	C3	C4 (Excellent)
Output (planning)	/3	/3	/3	/1

C1 Correct Interpretation of the Problem	C2 - Correct Use of Subject Matter Resources	C3 - Coherent Flow of Ideas	C4- Excellence
Indicators <ul style="list-style-type: none"> The situation is arousing the use of knowledge from other situations and clearly defined Collects correct information about time tabling 	Indicators <ul style="list-style-type: none"> Reflects on knowledge about Time, Factors, Multiples, lowest common multiples. Mathematical operations Counting/grouping Identifies the correct Mathematical operations for the task Selects the right materials for the task 	Indicators <ul style="list-style-type: none"> Formulation of ideas leading to the development of the procedure Drawing a time table Finished acceptable distribution plan 	Indicators <ul style="list-style-type: none"> Learner identifying the condition that the teacher should not have two lessons at the same time Organized

Total Mark = 10

Topic 4:

RECTANGULAR CARTESIAN COORDINATES IN 2 DIMENSIONS

By the end of this topic, the learner should be able to plot and interpret points in a range of contexts by:

- i) identifying the y-axis and x-axis (k, s).
- ii) drawing and labelling the Cartesian plane (k).
- iii) reading and plotting points on the Cartesian plane (k, s).
- iv) choosing and using appropriate scale for a given data set (k, u, s).
- v) identifying places on a map using coordinates [apply coordinates in real-life situations] (u s).

In this topic, you should make sure the learners have grid papers and mathematical sets for better delivery.

Observe the learners as they go through this topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In groups, let the learners discuss what the natural numbers are.

Let the learners do the exercise in this topic in their exercise books.

Activity 4.1: Plotting Points

Let the learners use the knowledge they acquired in their primary school education to carry out the activity.

The learners should display their work graphs so that other class members can give their comments.

In groups, let the learners work out the answers to the exercises. Harmonize their answers. Let them exchange their books and mark each other's exercises.

Allow the learners to comment on each other's work.

Sub-topic 4.1: Plotting Polygons (shapes)

The learners need to practise drawing the various shapes of polygons. If the learners can access hard cards, they can practise the making of these polygons.

Observe the learners as they go through drawing and making of the shapes. Look out for the individual learner's active participation, cooperation with members, and how they communicate with members of the group. Try to find out what mathematical skills the learners are using.

In groups, let the learners discuss what the natural numbers are.

Let the learners do the exercise in this sub-topic in their exercise books.

You can give an assignment to the learners to name more other polygons.

Activity 4.2: The line AB is one side of a square

This is a practical activity. The learners should use grid paper for better results.

In groups, let the learners work out the answers to the exercises. Harmonize their answers. Let them exchange their books and mark each other's exercises.

Allow the learners to comment on each other's work. For number 2, the learners should do it practically.

Activity 4.3

This is a practical activity, so the learners should have hands-on experience.

This exercise requires the learners to have the working materials such as grid papers, mathematical sets, pencils etc. in order to do it practically.

In groups, let the learners work out the answers to the exercise. Harmonize their answers. Let them exchange their books and mark each other's exercise.

Allow the learners to comment on each other's work.

Situation of Integration: A Senior One learner has reported in her class and has settled at her desk.

Support: The classroom is arranged in rows and columns. It is a big class and each learner has his/ her own desk.

Resources: Knowledge of horizontal and vertical lines i.e. rows and columns, coordinates.

Knowledge: Counting numbers

Task: The mathematics teacher has asked her to explain in writing how she can access her seat, starting from the entrance of the class. Discuss whether there are other ways of reaching her seat.

This should be in a group discussion. You should guide the learners during the discussions.

This scenario is practical, so each learner should have an opportunity to be involved in the hands-on experience.

You can give a scenario apart from the one in the Learner's Textbook.

Evaluation Criteria for the Task in Learners' Book on Page 63

Output 1: A Sketch of the Classroom

C1 = correct Interpretation of the problem

C2 = correct use of subject matter resources

C3 = coherent flow of ideas

	C1	C2	C3	C4 (Excellent)
Output (planning)	/3	/3	/3	/1

C1 - Correct Interpretation of the Problem	C2 - Correct use of Subject Matter Resources	C3 - Coherent Flow Ideas	C4- Excellence
Indicators	Indicators	Indicators	Indicators
<ul style="list-style-type: none"> The situation is arousing the 	<ul style="list-style-type: none"> Reflects on knowledge 	<ul style="list-style-type: none"> Formulation of ideas leading 	

use of knowledge from other situations and clearly defined. <ul style="list-style-type: none"> Collects correct information about the classroom. 	about Rows, Columns <ul style="list-style-type: none"> Identifies the starting point. Selects the right materials for the task. 	to the development of the procedure <ul style="list-style-type: none"> Drawing a sitting arrangement plan Finished sitting plan 	<ul style="list-style-type: none"> Neatness Organized
--	--	--	---

Total Mark = 10

Output 2: Written Explanation of the Classroom Sitting Plan

C1 = correct Information collected

C2 = correct presentation of Data

C3 = coherent flow of ideas

C4 = good communication skills

	C1	C2	C3	C4 (Excellent)
Output (planning)	/3	/3	/3	/1

C1- Correct Interpretation of the Problem	C2 - Correct Use of Subject Matter Resources	C3-Coherent Flow Ideas	C4- Excellence
Indicators <ul style="list-style-type: none"> The situation is arousing the use of 	Indicators <ul style="list-style-type: none"> Reflects on knowledge about 	Indicators <ul style="list-style-type: none"> Formulation of ideas leading to 	Indicators <ul style="list-style-type: none"> Logical reasons for the answer

<p>knowledge from other situations and clearly defined</p> <ul style="list-style-type: none"> • Collects correct information about the number of Rows, Columns and Starting point. 	<p>Counting Numbers, Coordinates, Counting/grouping</p> <ul style="list-style-type: none"> • Identifies the correct Mathematical operations for the task. • Selects the right materials for the task. 	<p>the development of the procedure</p> <ul style="list-style-type: none"> • Using the Starting point • Finished acceptable Explanation 	<ul style="list-style-type: none"> • Stating that start with rows and then columns from the starting point when locating a position/point
---	---	---	--

Total Mark = 10

Topic 5:

GEOMETRIC CONSTRUCTION SKILLS

By the end of this topic, the learners should be able to use the angle properties of lines and shapes to solve problems by:

- i) drawing perpendicular and parallel lines.
- ii) constructing perpendiculars, angle bisectors, mediators and parallel lines.
- iii) using compass and a ruler to construct special angles (60° , 45°).
- iv) describing a locus.
- v) relating parallel lines, perpendicular bisector, angle bisector, straight line and a circle as loci.
- vi) drawing parallel lines and polygons.
- vii) measuring lines and angles.
- viii) constructing geometrical figures such as triangle, square, rectangle, rhombus, parallelogram.

Sub-topic 5.1: Draw perpendicular and parallel lines

In this topic, you should make sure the learners have grid papers and mathematical sets for better delivery.

Activity 5.1: Drawing perpendicular and parallel lines

Observe the learners as they carry out the activity. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Observe the learners as they go through this topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Activity 5.2: Identifying lines

Sub-topic 5.2: Construction of Perpendicular lines

Activity 5.3: Construction of perpendicular line from an external point to a given line

Let the learners work in pairs and let them compare their answers 'Observe the learners as they go through this topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Activity 5.4: Construction of a perpendicular line to a given point on a given line segment

Let the learners work in pairs and let them compare their answers. Observe the learners as they go through this topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Activity 5.5: Construction of a Perpendicular Bisector

Let the learners work in pairs and let them compare their answers. Observe the learners as they go through this topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Activity 5.6: Construction of parallel lines

Let the learners work in pairs and let them compare their answers. Observe the learners as they go through this topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Sub –topic 5.2: Using a Ruler, Pencil and Pair of Compasses, Construct Special Angles

Activity5.7: Construction of special angles

Observe the learners as they construct special angles.

Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Sub-topic 5.3: Describing Locus Question

Activity 5.8: Discovering what Locus is

Observe the learners as they discover locus

Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Activity 5.8: Sketching and Describing Loci

Guide the learner go through the activity.

Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Activity 5.9: Demonstration of some simple Loci

Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Sub-topic 5.4: Construction of Geometric Figure

Activity 5.10: Construction of Geometrical figures

Let the learners work in pairs and let them compare their answers 'Observe the learners as they go through this topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Situation of Integration

In a village, there is an old man who wants to construct a rectangular small house of mud and wattle.



Task: The community asks you to accurately construct the foundation plan for this old man’s house.

Explain to the class how you have accurately constructed the foundation plan. Discuss whether there are other ways of constructing an accurate foundation plan.

The learners need to have materials and resources such as strings, sticks, machete, tape measure, knowledge of horizontal and vertical lines, and knowledge of construction of geometric figures.

In this topic, group the learners and let them have discussions. You should guide them during their discussion.

This scenario is practical, so each learner should have an opportunity to be involved in the hands-on experience.

You can give a scenario apart from that one in the Learner’s Textbook.

Evaluation Criteria for the task in Learners’ Textbook on Page 70

Output 1: Foundation plan

C1 = correct Interpretation of the problem

C2 = Correct use of subject matter resources

C3 = coherent flow of ideas

	C1	C2	C3	C4 (Excellent)
Output (planning)	/3	/3	/3	/1

C1- Correct Interpretation of the Problem	C2 - Correct Use of Subject Matter Resources	C3-Coherent Flow Ideas	C4-Excellence
Indicators <ul style="list-style-type: none"> • The situation is arousing the use of knowledge from other situations and clearly defined. • Collects correct information about the foundation. 	Indicators <ul style="list-style-type: none"> • Reflects on knowledge about Figures, Angles, properties of Geometric Figures, Parallel lines. • Identifies the correct Mathematical operations for the task. • Selects the right materials for the task. 	Indicators <ul style="list-style-type: none"> • Formulation of ideas leading to the development of the procedure • Drawing a foundation plan • Finished acceptable Foundation plan 	Indicators <ul style="list-style-type: none"> • Neatness • Accuracy

Total Mark = 10

Output 2: An Explanation of how to construct a foundation plan

C1 = correct Information collected

C2 = correct presentation of data

C3 = coherent flow of ideas

C4 = good communication skills

	C1	C2	C3	C4 (Excellent)
Output (planning)	/3	/3	/3	/1



C1- Correct Interpretation of the Problem	C2 - Correct Use of Subject Matter Resources	C3 - Coherent Flow Ideas	C4 - Excellence
<p>Indicators</p> <ul style="list-style-type: none"> • The situation is arousing the use of knowledge from other situations and clearly defined • Collects correct information about the Construction of 3Ds figures. 	<p>Indicators</p> <ul style="list-style-type: none"> • Reflects on knowledge about 3Ds Figures, Constructions of 3Ds • Identifies the correct Mathematical operations for the task. • Selects the right materials for the task. 	<p>Indicators</p> <ul style="list-style-type: none"> • Formulation of ideas leading to the development of the procedure • Drawing a Sketches of regular Rectangles • Written accurate and acceptable explanation of the plan 	<p>Indicators</p> <ul style="list-style-type: none"> • Logical procedural explanation • Stating Instruments/ Materials used

Total Mark = 10

Topic 6:

SEQUENCE AND PATTERNS

By the end of this topic, the learners should be able to explore number patterns and sequences by:

- i) drawing and identify the patterns.
- ii) describing a general rule of a given pattern.
- iii) describing a sequence.
- iv) determining a term in a sequence.
- v) finding the missing numbers in a given sequence.

In this topic, you should make sure the learners discuss and explain how they have formed and determined the patterns, and the sequences.

Sub-topic 6.1: Draw and identify the patterns

Activity 6.1: Identifying number patterns

Observe the learners as they go through this topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In groups, let the learners discuss what the patterns and sequences are.

Let the learners do the exercise in this topic in their exercise books.

Multiples were well covered in primary school level, so allow them to revise what they studied in primary. Let them be in groups and share their experiences with their neighbours.

In groups, let the learners work out the answers to the exercise. Harmonize their answers. Let them exchange their books and mark each other's work.

The multiples of 3 from the table are: 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 63, 66, 69, 72, 75, 78, 81, 84, 87, 90, 93, 96, 99.

The number is 4



In groups, let the learners work out the answers to the exercise. Harmonize their answers. Let them exchange their books and mark each other's work.

Note: The learners require some materials such as grid paper, colour pencils etc.

Sub-topic 6.2: Describing the general rule

Activity 6.2: Finding the Next Term

The learners need to practise finding the missing and next terms in a sequence.

Observe the learners as they go through finding and determining the missing terms.

Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In groups, let the learners discuss what the missing and next terms are.

Let the learners do the exercise in this sub-topic in their exercise books.

You can give assignments to the learners.

In groups, let the learners work out the answers to the exercise. Harmonize their answers. Let them exchange their books and mark each other's work.

- a) 78, 90, 102. b) 7.1, 7.7, 8.3. c) 26, 38. d) 19, 43. E) 4.12, 4.26, 4.40.
f) 7, 6.5, 6.

Sub-topic 6.2: Generating Number Sequence

Activity 6.3: Generating a sequence

The learners need to practise generating number sequence. Observe the learners as they go through generating sequences using number machines or formulae. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In groups, let the learners discuss how they are generating terms.

In groups, let the learners work out the answers to the exercise. Harmonize their answers. Let them exchange their books and mark each other's work.

Let the learners relate what they have done in this exercise with generating number sequence.

Sub-topic 6.3: Formulae for General Terms

Note: It is very helpful not only to be able to write down the next few terms in a sequence, but also to be able to write down, for example, the 100th or even the 1000th.

Guide the learners in their groups to work out the exercises to harmonise their answers.

Example: For the sequence 3, 7, 11, 15, ..., ...

Find:

- the next three terms.
- the 100th term.
- the 1000th term.

Answer

- You can see that 4 is added each time to get the next term.
So you obtain 19, 23, 27.
- To find the 100th term, starting at 3, you add 4 times ninety-nine times giving $3 + 4 \times 99 = 3 + 396 = 399$



- c) Similarly, the 1000th term is
 $3 + 4 \times 999 = 3 + 3996 = 3999$

I can go one step further and write down the formula for a general term i.e. the n th term.

This is $3 + 4 \times (n - 1) = 3 + 4n - 4$

$$= 4n - 1.$$

Let the learners use the knowledge they acquired in primary school level to carry out the activity.

Learners should display their work graphs so that other class members can give their comments.

In groups, let the learners work out the answers to the exercise. Harmonize their answers Let them exchange their books and mark each other's work.

Situation of Integration

There is a family in the neighbourhood of your school. The family has a rectangular compound on which they want to put up a hedge around. The hedge shall be made up of plant seedlings of different colours.

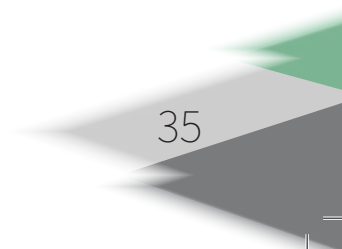
Support: Physical instruments like hoes, machetes, tape measure

Resources: Knowledge of construction of figures like rectangles, patterns, sequences

Task: The family requests you to plant the hedge around their rectangular compound so that it looks beautiful.

Explain how you will plant the hedge, making sure that the plants at the corners of the compound are the same in terms of colour.

Discuss whether there are other ways of planting the hedge.



The learners need to have materials and resources such as strings, sticks, machete, tape measure, and knowledge of horizontal and vertical lines, seedlings of different colours.

In this topic, group the learners and let them discuss. You should guide the learners during the discussion.

This scenario is practical, so each learner should have an opportunity to be involved in the hands-on experience.

You can give a scenario apart from the one in the Learner's Textbook.

Evaluation Criteria for the Task in Learner's Textbook on Page 85

Output 1: Plan for Planting a Hedge around the Compound

C1 = correct Interpretation of the problem

C2 = correct use of subject matter resources

C3 = coherent flow of ideas

	C1	C2	C3	C4 (Excellent)
Output (planning)	/3	/3	/3	/1



C1 - Correct Interpretation of the Problem	C2 - Correct Use of Subject Matter Resources	C3- Coherent Flow Ideas	C4 - Excellence
<p>Indicators</p> <ul style="list-style-type: none"> • The situation is arousing the use of knowledge from other situations and clearly defined • Collects correct information (measurements) about the compound. 	<p>Indicators</p> <ul style="list-style-type: none"> • Reflects on knowledge about Measurements, Colours of the plants and Mathematical operations, sequencing. • Identifies the correct Mathematical operations for the task. • Selects the right materials for the task. 	<p>Indicators</p> <ul style="list-style-type: none"> • Formulation of ideas leading to the development of the procedure • Drawing a distribution plan for different colours of plants • Finished acceptable Sequencing plan 	<p>Indicators</p> <ul style="list-style-type: none"> • Neatness • organized

Total Mark = 10

Output 2: Written Explanation how the Seedlings will be planted

C1 = correct Information collected

C2 = correct presentation of Data

C3 = coherent flow of ideas

C4 = good communication skills

	C1	C2	C3	C4 (Excellent)
Output (planning)	/3	/3	/3	/1

C1 - Correct Interpretation of the Problem	C2 - Correct Use of Subject Matter Resources	C3 - Coherent Flow Ideas	C4 - Excellence
Indicators <ul style="list-style-type: none"> • The situation is arousing the use of knowledge from other situations and clearly defined • Collects correct information about the Dimensions of the compound and materials to be used 	Indicators <ul style="list-style-type: none"> • Reflects on knowledge about Sequences, Measurements, Mathematical operations, Counting/grouping. • Identifies the correct Mathematical operations for the task and colours. • Selects the right materials for the task. 	Indicators <ul style="list-style-type: none"> • Formulation of ideas leading to the development of the procedure • Drawing a distribution plan • Finished and acceptable plan for planting the seedlings according to their colour 	Indicators <ul style="list-style-type: none"> • Logical reasons for the answer • Recording Numbers of used seedlings according to their colour

Total Mark = 10



Topic 7:

BEARINGS

By the end of this topic, the learners should be able to understand and use compass points, bearings and scale drawings by:

- i) reviewing the compass.
- ii) describing the direction of a place from a given point using cardinal points.
- iii) describing the bearing of a place from a given point.
- iv) drawing suitable sketches from the given information.
- v) choosing and use appropriate scale to draw an accurate diagram.
- vi) differentiating between a sketch and a scale drawing.
- vii) applying bearings in real-life situations.

In this topic, you should make sure the learners discuss and explain the difference between direction and bearings.

Observe the learners as they go through this topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In groups, let the learners discuss what bearing, sketch and scale drawing are.

Activity 7.1: Identifying the angles in relation to the compass direction

Make the following turnings and in each case state the size of the angle you have turned through.

- i) Turn from N to S clockwise or anticlockwise
- ii) Turn from NE to SE clockwise
- iii) Turning clockwise from NE to E

Let the learners use the knowledge they acquired in their primary school level to carry out the activity.

Let every learner participate in this activity.

i) 180° ii) 90° iii) 45°

Exercise

1. What angle do you turn through if you turn clockwise from:
 - (a) N to E? (b) W to NW? (c) SE to NW? (d) NE to N? (e) W to NE?
 - (f) S to SW? (g) S to SE? (h) SE to SW? (i) E to SW?
2. In what direction will you be facing if you turn:
 - (a) 180° clockwise from NE?
 - (b) 180° anticlockwise from SE?
 - (c) 90° clockwise from SW?
 - (d) 45° clockwise from N?
 - (e) 225° clockwise from SW?
 - (f) 135° anticlockwise from N?
 - (g) 315° clockwise from SW?
3. The sails of a windmill complete one full turn every 40 seconds.
 - (a) How long does it take the sails to turn through:
 - (i) 180° (ii) 90° (iii) 45° ?
 - (b) What angle do the sails turn through in:
 - (i) 30 seconds? (ii) 15 seconds? (iii) 25 seconds?

In groups, let the learners work out the answers to the exercise. Harmonize their answers. The learners should discuss how they obtained the answers. Let them exchange their books and mark each other's work.

Sub-topic 7.2: Bearings

The bearing of a point is the number of degrees in the angle measured in a clockwise direction from North line to the line joining the centre of the compass with the point. A bearing is used to present the direction of one-point relative to another point.

In groups, let the learners work out the answers to the exercise. Harmonize their answers. Let them exchange their books and mark each other's work.

Activity 7.2: Estimating bearings of some places within the school compound

From your school flag post, estimate the bearings of each building found in the school.

Note: Three figures are used to give bearings. All bearings are measured in a horizontal plane.

Exercise

- Find the bearing of each of the following directions:
(a) S (b) NE (c) N (d) NW
- Find the bearing of each of the following directions:
(a) $N60^{\circ}E$ (b) $N35^{\circ}E$ (c) $N90^{\circ}W$ (d) $S40^{\circ}E$
- Draw a scale diagram to show the position of a ship which is 270 km away from a port on a bearing of 110° .

Answers

1. a) 180° b) 045° c) 000° d) 315°

2. a) 060° b) 035° c) 270° d) 140°

Situation of Integration

Ajok is in Kampala City and has been told to use a car to move to Lira town. She has never gone to Lira. She has been given the map of Uganda showing routes through which she can access Lira town.

Support: Mathematical instruments, pencil, paper, pens, tracing paper and map of Uganda

Resources: Knowledge of construction of figures like triangles, lengths of sides of triangles, operations on numbers.

Task: Ajok wants to use a short distance from Kampala to Lira.

Explain how Ajok can determine the shortest distance. Using the Map given to her, is it possible for Ajok to use the shortest distance she has determined? Explain your answer.

The learners need to have materials and resources such as strings, sticks, machete, tape measure, and knowledge of horizontal and vertical lines, seedlings of different colours.

In this topic, group the learners and let them discuss. You should guide the learners during the discussion.

This scenario is practical, so each learner should have an opportunity to be involved in the hands-on experience.

You can give a scenario apart from the one in Learner's Textbook.



Evaluation Criteria for the Task in Learner’s Textbook on Page 90

Output 1: A Sketch Showing Routes

C1 = correct Interpretation of the problem

C2 = correct use of subject matter resources

C3 = coherent flow of ideas

	C1	C2	C3	C4 (Excellent)
Output (planning)	/3	/3	/3	/1

C1 - Correct Interpretation of the Problem	C2 - Correct Use of Subject Matter Resources	C3 - Coherence Flow Ideas	C4 - Excellence
<p>Indicators</p> <ul style="list-style-type: none"> • The situation is arousing the use of knowledge from other situations and clearly defined. • Collects correct information about the directions and distances from a given point (Kampala). 	<p>Indicators</p> <ul style="list-style-type: none"> • Reflects on knowledge about Directions, Mathematical operations. • Identifies the correct Mathematical operations for the task. • Selects the right materials for the task. 	<p>Indicators</p> <ul style="list-style-type: none"> • Formulation of ideas leading to the development of the procedure • Drawing a Sketch • Finished acceptable Sketch 	<p>Indicators</p> <ul style="list-style-type: none"> • Neatness • Organized

Total Mark = 10

Output 2: A Written Procedure for Coming up with the Sketch

C1 = correct Information collected

C2 = correct presentation of Data

C3 = coherent flow of ideas

C4 = good communication skills

	C1	C2	C3	C4 (Excellent)
Output (planning)	/3	/3	/3	/1

C1 - Correct Interpretation of the Problem	C2 - Correct Use of Subject Matter Resources	C3 - Coherence Flow of Ideas	C4 - Excellence
Indicators <ul style="list-style-type: none"> The situation is arousing the use of knowledge from other situations and clearly defined Collects correct information about the routes. 	Indicators <ul style="list-style-type: none"> Reflects on knowledge about Measurements, Bearings Mathematical operations, Angles. Identifies the correct Mathematical operations for the task. Selects the right materials for the task. 	Indicators <ul style="list-style-type: none"> Formulation of ideas leading to the development of the procedure Writing a logical Explanation procedure Finished acceptable and can be followed procedure 	Indicators <ul style="list-style-type: none"> Logical reasons for the answer Giving reasons why some routes may not be used

Total Mark = 10



Topic 8:

GENERAL AND ANGLE PROPERTIES OF GEOMETRIC FIGURES

By the end of this topic, learners should be able to use the angle properties of lines and shapes to solve problems by:

- i) identifying different angles.
- ii) solving problems involving angles on a straight line, angles on transversal and parallel lines.
- iii) stating and using angle properties of polygons in solving problems.

In this topic, you should make sure the learners discuss and explain the angle properties and use them to solve problems.

8.1: Identify Different Angles

Activity 8.1: Identifying objects that form angles

Learners should be encouraged to own their own mathematical set and all activities in this topic should be practical.

Observe the learners as they go through this topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

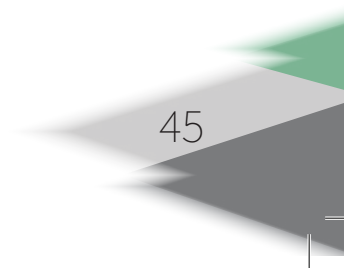
Sub- topic 8.2: Angles on a Line and Angles at a Point

Activity 8.1: Identifying angles

In groups, let the learners discuss the properties of angles.

Activity 8.2: Identifying the polygons

Guide the learners as they identify different polygons. Let them work in pairs.



Topic 9:

DATA COLLECTION AND PRESENTATION

By the end of this topic, the learners should be able to collect and present different sorts of data by:

- i) understanding the differences between types of data.
- ii) collecting and representing simple data from local environment using bar chart, pie chart and line graph.

Sub-topic 9.1: Types of Data

Qualitative data is data that is not given numerically e.g. favourite colour, place of birth, favourite food and type of car.

Quantitative data is numerical. There are two types of quantitative data: discrete and continuous data. Discrete data can only take specific numeric values e. g. shoe size, number of brothers, number of cars in a car park. Continuous data can take any numerical value e.g. height, mass, length.

Activity 9.1 Identifying types of data

Let the learners work in pairs .Observe them as they work. Observe the learners as they go through this activity. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Which of the following terms best describe each of the information listed (i) to (vii)?

- Qualitative data
- Continuous quantitative data
- Discrete quantitative data

(i) Age

(ii) Birth place

(iii) Height

(iv) World ranking

- (v) Aces
- (vi) First serve the school
- (vii) School life

Solution

- i) Discrete quantitative, because it is given as a whole number
- ii) Qualitative
- iii) Continuous qualitative. It can take any value, although it is given here to the nearest cm
- iv) Discrete quantitative – it can only take positive whole numbers
- v) Discrete quantitative
- vi) Continuous quantitative – although it should be noted that it is given here as a whole number
- (vii) Qualitative

In groups, let the learners work out the answers to the exercise.

The groups should defend their answers. Harmonize their answers. Let them exchange their books and mark each other’s work.

Sub-topic 9.2: Collecting Data

In this section, explain to the learners how data is collected, organized and interpreted, using a tally chart and then displayed using:

- i) Pictograms
- ii) Bar charts
- iii) Pie charts

Activity 9.1: Collecting data

Let the learners work in groups. Observe them as they work. Observe the learners as they go through this activity. Look out for the individual learner’s active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Note: A hypothesis is an idea that you want to investigate to see if it is true or false. For example, you might think that most people in your school get there

by bus. You could investigate this using a survey. A tally chart can be used to record your data.

In groups, let the learners work out the answers to the exercise.

The groups should defend their answers. Harmonize their answers. Let them exchange their books and mark each other's work.

Situation of Integration

The Games Master at your school wants to buy football boots for the three teams in the school. The three teams are the under 18 years, under 16 years and the under 1.

Support: Pens, paper, tape measure, team members

Resources: Knowledge of tabulation, of tallying, of approximation, of central measures and of collection of suitable data. The Games Master does not know the foot size for each of the players.

Task: The total number of players for the three teams is 54. The Games Master wants to know the size of the boots for each player and the number of pairs for each size.

Explain how the Games Master will get the required data and how to determine the total cost for buying the football boots for the 54 players.

Is there another way of getting the required data other than what you have explained above?



Evaluation Criteria for the Task in Learner’s Textbook on Page 104

Output 1: Data Collected

C1 = correct Interpretation of the problem

C2 = correct use of subject matter resources

C3 = coherent flow of ideas

	C1	C2	C3	C4 (Excellent)
Output (planning)	/3	/3	/3	/1

C1 - Correct Interpretation of the Problem	C2-Correct Use of Subject Matter Resources	C3 - Coherent Flow Ideas	C4 - Excellence
<p>Indicators</p> <ul style="list-style-type: none"> The situation is arousing the use of knowledge from other situations and clearly defined Collects appropriate raw Data 	<p>Indicators</p> <ul style="list-style-type: none"> Reflects on knowledge about Data collection, Mathematical operations, Counting/grouping. Identifies the correct Mathematical operations for the task. Selects the right materials/instruments for the task. 	<p>Indicators</p> <ul style="list-style-type: none"> Formulation of ideas leading to the development of the procedure Drawing a Table Finished Tabulation 	<p>Indicators</p>

Total Mark = 8

Output 2: Processed Data (information)

C1 = correct Information collected

C2 = correct presentation of data

C3 = coherent flow of ideas

C4 = good communication skills

	C1	C2	C3	C4 (Excellent)
Output (planning)	/3	/3	/3	/1

C1 - Correct Interpretation of the Problem	C2 - Correct use of Subject Matter Resources	C3 - Coherent Flow Ideas	C4 - Excellence
Indicators <ul style="list-style-type: none"> The situation is arousing the use of knowledge from other situations and clearly defined Collects correct information about the number of households and members of each household. 	Indicators <ul style="list-style-type: none"> Reflects on knowledge about Tabulation, Mathematical operations, Counting/grouping. Identifies the correct Mathematical operations for the task. Selects the right materials for the task. 	Indicators <ul style="list-style-type: none"> Formulation of ideas leading to the development of the procedure Tabulating the data Selecting the appropriate display of data 	Indicators <ul style="list-style-type: none"> Recommendation on quantities and sizes of the Boots to be bought Writing up the procedure of how to collect the Data

Total Mark = 10



Topic 10:

REFLECTION

By the end of this topic, the learners should be able to reflect shapes in a range of contexts and identify lines of symmetry by:

- i) identifying lines and planes of symmetry for different figures.
- ii) stating and using properties of reflection as a transformation.
- iii) making geometrical deductions using reflection (distinguish between direct and opposite congruence).
- iv) applying reflection in the Cartesian plane.

In this topic, you should make sure the learners discuss and do reflection practically.

Learners should have the following materials for the practicals for example mirror, grid papers etc.

Observe the learners as they go through this topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Sub-topic 10.1: Identify Lines of Symmetry for Different Figures

Activity 10.1: Identifying lines of symmetry

Let the pairs display their work.

The learners should move around viewing their colleagues' and give comments.

Harmonise their comments and let the pairs exchange their work and mark.

In groups, let the learners work out the answers to the exercise.

The groups should defend their answers.

Harmonize their answers.

Let them exchange their books and mark each other's work.

Sub-topic 10.2: Reflection in the Cartesian Plane

Activity 10.2: Reflecting in a Cartesian plane

Let the learners be in pairs. Guide them in forming the pairs.

Move around as the learners do the activity and correct them where they are wrong.

Let them display their work for the whole class discussion.

Harmonise their work.

Let the pairs exchange their work for marking.

In groups, let the learners work out the answers to the exercise.

The groups should defend their answers.

Harmonize their answers.

Let them exchange their books and mark each other's work.



Topic 11:

EQUATION OF LINES AND CURVES

By the end of this topic, the learners should be able to understand and use linear equations and their graphs by:

- i) forming linear equations with given points (k, s) .
- ii) drawing the graph of a line given its equation (u, s) .
- iii) differentiating between a line and a curve (u, s) .

In this topic, you should make sure the learners discuss and explain the difference between lines and curves.

The learners need to understand that when equations are being solved, it's like balancing a weighing machine when measuring masses.

Observe the learners as they go through this topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In groups, let the learners discuss what a line and a curve are.

Fundamental Algebraic Skills

In this section, you should let the learners review some fundamental algebraic skills they studied in their primary school level by examining codes and how to use formulae.

Example

If $a = 4$, $b = 7$ and $c = 3$, calculate:

- (a) $6 + b$ (b) $2a + b$ (c) ab (d) $a(b - c)$ (e) $a(b - c)$

Solution

- (a) $6 + b = 6 + 7 = 13$

$$(b) 2a + b = 2 \times 4 + 7 = 8 + 7 = 15$$

$$(c) ab = 4 \times 7 = 28$$

$$(d) a(b - c) = 4 \times (7 - 3) = 4 \times 4 = 16$$

Example

Simplify where possible:

$$(a) 2x + 4x \quad (b) 5p + 7q - 3p + 2q$$

$$(c) y + 8y - 5y \quad (d) 3t + 4s$$

Solution

$$(a) 2x + 4x = 6x$$

$$(b) 5p + 7q - 3p + 2q = 5p - 3p + 7q + 2q = 2p + 9q$$

$$(c) y + 8y - 5y = 9y - 5y = 4y$$

$$(d) 3t + 4s = 3t + 4s.$$

Solution to the exercises in Learner's Book (p.108)

In groups, let the learners work out the answers to the exercise.

The groups should defend their answers. Harmonize their answers. Let them exchange their books and mark each other's work.

Later on collect their exercise books to confirm whether the books have been marked correctly.



Sub-topic 11.1 Function Machines

In this section, you will look at how to find the input and output of function machines.

INPUT \rightarrow FUNCTION MACHINE \rightarrow OUTPUT

Activity 11.1: Function machine activity

Explain to the learners how function works.

The learners need to practise generating number sequences.

Observe the learners as they go through generating sequences using number machines or formulae. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In groups, let the learners discuss how they are generating terms.

Example

Calculate the output of each of these function machines:

(a) $4 \rightarrow \times 5 \rightarrow ?$

(b) $5 \rightarrow \times 2 \rightarrow -1 \rightarrow ?$

(c) $-3 \rightarrow +8 \rightarrow \times 7 \rightarrow ?$

Solution

(a) The input is simply multiplied by 5 to give 20:

$$4 \rightarrow \times 5 \rightarrow 20$$

(b) The input is multiplied by 2 to give 10, and then 1 is subtracted from this to give 9:

$$5 \rightarrow \times 2 \rightarrow -1 \rightarrow 9$$

(c) First, 8 is added to the input to give 5, and this is then multiplied by 7 to give 35:

$$-3 \rightarrow +8 \rightarrow \times 7 \rightarrow 3$$

In groups, let the learners work out the answers to the exercise.

The groups should present and defend their answers. Harmonize their answers. Let them exchange their books and mark each other's work.

Later on collect their exercise books to confirm whether the books have been marked correctly.

Sub-topic 11.2: Linear Equations

An equation is a statement, such as $3x + 2 = 17$, which contains an unknown number. In this case, it is x . The aim of this section is to show how to find the unknown number, x .

All equations contain an “equals” sign.

To solve the equation, you need to reorganize it so that the unknown value is by itself on one side of the equation. This is done by performing operations on the equation. When you do this, in order to keep the equality of the sides, you must remember that **“Whatever you do to one side of an equation, you must also do the same to the other side”**.

Observe the learners as they go through generating sequences using number machines or formulae. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In groups, let the learners discuss how they are generating terms.



Example

Solve these equations:

- a) (a) $x + 2 = 8$ (b) $x - 4 = 3$ (c) $3x = 12$
 b) (d) $2x + 5 = 11$ (e) $3 - 2x = 7$

Solution

(a) To solve this equation, subtract 2 from each side of the equation:

$$X + 2 = 8$$

$$X + 2 - 2 = 8 - 2$$

$$X = 6$$

(b) To solve this equation, add 4 to both sides of the equation:

$$X - 4 = 3$$

$$X - 4 + 4 = 3 + 4$$

$$X = 7$$

(c) To solve this equation, divide both sides of the equation by 3:

$$3x = 12$$

$$3x \div 3 = 12 \div 3$$

$$X = 4$$

(d) This equation must be solved in 2 stages.

First, subtract 5 from both sides:

$$2x + 5 = 11$$

$$2x + 5 - 5 = 11 - 5$$

$$2x = 6$$

Then, divide both sides of the equation by 2:

$$2x \div 2 = 6 \div 2$$

$$X = 3.$$

(e) First, subtract 3 from both sides:

$$3 - 2x = 7$$

$$3 - 3 - 2x = 7 - 3$$

$$-2x = 4$$

Then divide both sides by (-2);

$$-2x \div -2 = 4 \div -2$$

$$X = -2.$$

In groups, let the learners work out the answers to the exercise.

The groups should present and defend their answers. Harmonize their answers. Let them exchange their books and mark each other's work.

Later on collect their exercise books to confirm whether the books have been marked correctly.

Topic 12:

TIME AND TIME TABLES

By the end of this topic, the learner should be able to understand and use time by:

- i) identifying and using units of time (k, u, s).
- ii) using and interpreting different representations of time (u, s).
- iii) applying the understanding of time in a range of relevant real-life contexts (u, s).

In this topic, you should make sure the learners discuss and explain the difference between time and timetables and how time is measured.

Observe the learners as they go through this topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In groups, let the learners discuss what a line and a curve are.

Subtopic 12.1: Telling the Time

In this section we look at different ways of writing times; for example, **7:45** is the same time as **quarter to eight**.

On a clock face, this can be represented as shown below.



Also remember that

One hour = 60 minutes

So that

Half an hour = 30 minutes

Quarter of an hour = 15 minutes

Three quarters of an hour = 45 minutes

Observe the learners as they go through this subtopic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In groups, let the learners discuss how they are generating terms.

Example

Write each time using digits and show the position of the hands on a clock face:

- (a) twenty-five past eight.
- (b) quarter to ten.

Solution

- (a) Twenty-five past eight using digits is **8:25**



- (b) Quarter to ten can be thought of as:
15 minutes to 10 o'clock

Or

45 minutes past 9 o'clock

So, using digits, quarter to ten is **9:45**



Solution to the Exercises in Learner's Textbook (p. 118)

In groups, let the learners work out the answers to the exercise.

The groups should present and defend their answers. Harmonize their answers. Let them exchange their books and mark each other's work.

Later on collect their exercise books to confirm whether the books have been marked correctly.

Sub-topic 12.2: 12-hour and 24-hour Clocks

The 24-hour clock system can be used to tell if time is in the morning or afternoon. Alternatively, time can be given as **am** or **pm**.

Example

Write these times in 24-hour clock:

- (a) 3:06 am (b) 8:14 pm

Solution

- (a) As this is **am** the time remains the same except you add a zero in front of 3, so the time becomes **0306 in a 24-hour clock**.
 (b) As this is **pm**, you add 12 to the hours to give you 2014 in a 24-hour clock.

Activity 14.1: converting from 12 hour to 24 hour and vice versa

Observe the learners as they go through this sub-topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In groups, let the learners work out the answers to the exercise.

The groups should present and defend their answers. Harmonize their answers. Let them exchange their books and mark each other's work.

Later on collect their exercise books to confirm whether the books have been marked correctly.

Sub-topic 12.3: Units of time

Observe the learners as they go through this subtopic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

Activity 14.2

Let the learners work in pairs as you observe them

Observe the learners as they go through this sub-topic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

In this section we explore the different units of time.

1 minute	=	60 seconds
1 hour	=	60 minutes
1 day	=	24 hours
1 week	=	7 days
1 year	=	365 Or 366 days

1. How many hours are there in May?

Solution

Number of hours in May = $31 \times 24 = 744$ hours

Example

25 February is a Friday. What will be the date on the next Friday?

- (a) If it is not a leap year?
- (b) If it is a leap year?

Solution

(a) You could write out the 7 days like this:

Friday 25
 Saturday 26
 Sunday 27
 Monday 28
 Tuesday 1
 Wednesday 2
 Thursday 3
 Friday 4

Or

$$25 + 7 = 32$$

$$32 - 28 = 4$$

So the next Friday will be 4th March.

(b) Using the addition method:

$$25 + 7 = 32$$

$$32 - 29 = 3$$

So, in a leap year, the next Friday will be 3rd March.

In groups, let the learners work out the answers to the exercise.

The groups should present and defend their answers. Harmonize their answers. Let them exchange their books and mark each other's work.

Later on collect their exercise books to confirm whether the books have been marked correctly.

Sub-topic 12.4: Timetables

In this section we consider how to extract information from timetables.

Observe the learners as they go through this subtopic. Look out for the individual learner's active participation, cooperation with members, and how he/she communicates with members of the group. Try to find out what mathematical skills the learners are using.

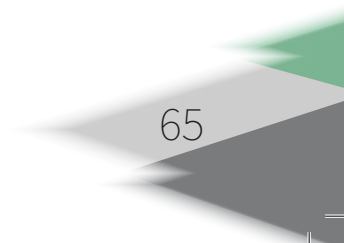
Explain to learners what the following words mean: Duration, Arrival and Departure in relation to time and timetables.

In groups, let the learners work out the answers to the exercise.

The groups should present and defend their answers. Harmonize their answers.

Let them exchange their books and mark each other's work.

Later on collect their exercise books to confirm whether the books have been marked correctly.





National Curriculum
Development Centre,
P.O. Box 7002, Kampala.
www.ncdc.go.ug